ON THE HISTORY OF TUBERCULOUS MENIN-
GITIS.

BY W. W. GERHARD, M. D.

In the last number of the Medical Examiner I published a translation of a portion of the article upon Meningitis, by M. Guersant, and the correspondence which afterwards was published in the Archives, relative to this subject. In itself, the matter was of little importance, but as the discovery of the true nature of the disease did not arise from accident, but was the direct consequence of a course of laborious investigation, I attach more importance to the matter than I should do under other circumstances.

In the article upon Meningitis by M. Guersant, the attempt is made to refer the discovery of the connexion between tubercles in the membranes of the brain and acute hydrocephalus, as far back as the time of Willis. This is about as reasonable as it would be to ascribe all possible researches to the older writers; the germ of every thing that has been discovered, and probably of every thing that will be discovered, is to be found in the ancient writers, but the mere obscure allusion does not constitute positive knowledge. In various writings, the description of tubercles in the brain and its membranes may be found, but they are invariably stated to be mere complications, and usually accidental ones of acute hydrocephalus. The accounts of writers are singularly uniform on this point, differing only in this respect, that one class represents the tuberculous diathesis as a predisposing cause of the disease, while another attributes the inflammation to the tubercles as the immediate exciting cause. Both of these suppositions are to a certain extent well founded, the former much more frequently than the latter.

The last, and by far the most complete account of the tuberculous granulations as occurring in acute hydrocephalus, is to be found in the memoir of Dance on this subject, the concluding part of this paper appeared in the Archives in 1830, a little more than two years before the commencement of the researches of Dr. Rufz and myself. M. Dance has given a correct though incomplete description of the tuberculous granulations in the pia mater, which are, as he states, a frequent cause of acute hydrocephalus. He describes the granulations as a cause of the disease, and in fact recognises the granulations themselves only in those cases in which they have attained a considerable size, and are evidently tubercu-

lous. In the greater part of the cases which he describes, the disease was certainly the ordinary tuberculous meningitis, but as the tuberculous granulations were small, and, comparatively speaking, concealed by the effusion of serum and lymph, they must have escaped attention. M. Dance expressly stated that these granulations were merely a complication of the disease, and gives the following definition of acute hydrocephalus. It is " an inflammation seated primarily or secondarily in the cerebral ventricles, (in their internal membrane and the layer of subjacent cerebral substance,) giving rise to a more or less considerable serous effusion into these cavities, afterwards to a more or less extended softening of these walls, complicated frequently with meningitis, especially at the base of the brain, and producing a form of symptoms differing in general from those of all other cerebral diseases, which is owing in great part to its peculiar position, and, above all, to the *effusion* produced by it. On this account we believe that it is proper to preserve the term acute hydrocephalus." (Archives, vol. 22, p. 322.)

The tuberculous or scrofulous diathesis which M. Dance, in common with many others, noticed as complications of acute hydrocephalus, is, in fact, much more important than it seemed to him. The lymphatic temperament is the ultimate cause of the disease. According to the opinion of Mons. D., it acts in two ways. In the one, tubercles are already present in the membranes of the brain, and "foment," to use the expression of M. Dance, the inflammation. This is the variety of the disease in which the tuberculous character of the disease was so evident that there could be no doubt as to its real nature. The second variety is that in which the lymphatic temperament is the remote cause of the disorder; this is also generally admitted by many of the older writers, not merely a cause favouring the development of hydrocephalus.

I have confined my remarks to the works of M. Dance, as he is the only writer whose views approach nearly to our own, and by a reference to his article it will be seen that this approximation is limited entirely to one thing—a more accurate anatomical description of tubercles when they are evident in the pia mater than was given by preceding writers. He has totally passed over the cases in which the tuberculous disease must have existed, although, as yet, in a forming state, and he has not hinted at the pathology of the most frequent form of the disease. This is that in which the tuberculous granulations are secret-

ed by the same inflammatory process which constitutes the disease, the scrofulous temperament acting merely as a remote cause.

I will next inquire in what the observations of M. Rufz and myself differ from them. It is in this—that we state and prove, by rigid deductions, that the acute meningitis, or acute hydrocephalus, if the older term be preserved, is really a tuberculous disease, it is inflammatory in its direct action, and the tuberculous granulations are either formed already in the brain and followed by the acute inflammation, or they are secreted by the inflammatory process, the vessels throwing out at the same time lymph and tuberculous matter. This disease is by far the most frequent of the acute inflammatory disorders of the brain in children, especially from the age of two years to that of puberty, and we therefore separate this disease from other acute affections of the brain, laying stress upon the peculiar nature of the disease as connected with the tuberculous secretion, and looking upon the affection as one and the same whether the inflammation attacks the membranes only, or extends to the substance of the brain, and whether there is or is not an effusion of serum into the ventricles. This view then of the pathology of the disease renders the term hydrocephalus obviously improper, and it was this which induced us to substitute that of tuberculous meningitis, which has since come into general use.

The new view of the disease was a necessary consequence of the improved condition of pathological knowledge, and of the methods of examining and of drawing deductions from facts, and it would necessarily have been taken by any one who had followed out the same course of research. That it was not adopted by others previously to the observations of M. Rufz and myself, is very obvious from the examination of the essay by M. Dance, which was published but little more than two years before the commencement of our researches. From the year 1830 to 1832, but little attention seemed directed to this subject, and no memoir in reference to it appeared ; in the months of April and May of that year the cholera appeared at Paris ; after its cessation, I ceased to follow the practice of the larger hospitals, and commenced a series of studies at the children's hospital at the beginning of June, 1832 ; after observing at the hospital for some weeks, I determined to continue my observations there for as long a period as practicable, and was constantly engaged in noting cases and studying the diseases of children until January, 1834, a period of eighteen months. Soon after the commencement of these researches, M. Rufz, who was attached to the service of M. Guersant, associated himself with me ; to a certain extent, we were each studying the diseases in different wards of the hospital, but agreed to compare together our notes, and thus arrive at some conclusions more rapidly than we other-

wise should do. The kindness of MM. Jadelot and Bouneau enabled me to pursue these observations during this period, and the position of Dr. Rufz at the hospital gave him the necessary facilities for observing the patients under the care of Drs. Guersant and Baudelocque. We were very soon struck with the tuberculous granulations which were so evident in some cases of meningitis ; in other cases we did not at first venture to regard these granulations as tuberculous, but we commenced a careful examination of the other organs of the body, and ascertained that in every case of a certain class, there was direct evidence of a tuberculous disease. From this circumstance and the examination of the brain, we finally arrived at the conclusion that the disease was strictly tuberculous. The disease was not separated by us from ordinary cases of meningitis, solely because it was connected with a tuberculous deposit ; it presented, in most cases, a train of symptoms which are to a great degree peculiar, and have an individual character; although the distinctive signs of the disorder were not discovered until the anatomical characters had been ascertained.

The first publication made by either of us, was by Dr. Rufz, in February, 1833, in which he described the granulations, but did not yet connect them with the tuberculous diseases. This connection was ascertained by us in the course of the spring or summer of the same year, when we had collected a sufficient number of observations to justify us, as we thought, in drawing some conclusions from them. All the observations which I had noted, agreed in giving the same result, beginning from June, 1832: the later cases of Dr. Rufz coincided perfectly with them, but those noted previously to the months of September or October, did not lead to any definite result, because they were too imperfect. The earlier cases were incomplete, because Dr. Rufz did not then, at first, intend to continue his researches at the children's hospital beyond a short period, and therefore devoted less time to these notes than he afterwards gave to them. The first series of cases which demonstrated the nature of the disease were those which I had noted, but as the studies of both M. Rufz and myself were made afterwards in such a way as materially to assist our researches, the additions made to our knowledge of acute hydrocephalus, was regarded by us as the fruits of our joint researches.

The first publication which I made upon the subject was in the American Journal for February, 1834, in a paper written at Paris in September or October, 1833 ; the character of the disease is there stated. The second part of the memoir was published in May of the same year.

Dr. Rufz published his thesis on the same subject in 1835. These papers all related to acute hydrocephalus, or rather tuberculous me-

ningitis, as it occurs in children, but in the year 1835, in the same journal, I published a memoir upon the acute hydrocephalus of adults, proving that it was identical with the tuberculous meningitis of children, and depended upon the same causes. This was the first memoir which proved that the disease was as distinctly characterized in adults as in children, and that the anatomical lesion was in both cases independent of the effusion of serum into the ventricles of the brain.

These remarks show that the disease was not described in such a manner as to give it a separate existence, until the researches of Dr. Rufz and myself. Since that period, many others, especially of the internes at the Children's Hospital, have written upon the same disease, which they agree in considering as a tuberculous meningitis. Amongst these later writers is the late M. Constant, who began his researches at the Children's Hospital in January, 1833, after M. Rufz and myself had collected a large proportion of cases upon the same subject. His observations were made less elaborately than those which led us to these conclusions, chiefly during a short visit in each morning; they, however, confirmed our previous researches. M. Guersant was in error when he seems to intimate that the researches of M. Constant upon this subject were anterior to ours. He had no knowledge of the intimate connection between the tuberculous diseases and acute hydrocephalus until they were pointed out to him at the hospital. Of the occasional connexion of tubercles of the membranes and meningitis he was no doubt aware, like all others who were acquainted with the previous publication upon this subject; but the knowledge of the true relations of the disease could scarcely have been attained without a course of laborious researches similar to those undertaken by us. The labour that we incurred is the chief reason why we attach importance to the subject.

Cases of treatment of Disease by the use of the Saratoga Water. By MILO L. NORTH, M. D., of Saratoga Springs.

Saratoga Springs, 8th May, 1840.

To the Editors of the Medical Examiner.

GENTLEMEN:—I forward you a few extracts from my medical case book, kept here in the season of 1838 and 1839. The language, especially of the symptoms, is very nearly as it was taken during the hurry and pressure of our short and busy season.

Respectfully yours, MILO L. NORTH.

CASE I.—*Dyspepsia, with Emaciation and Night-Sweats.*

August 17th, 1839.—C. A. B., a merchant, from western New York, aged about forty-two. Has dry, short cough; great debility; sweats towards morning; bowels irregular; secretion of urine variable; pulse eighty-four,

and soft; tongue foul; appetite indifferent; is losing flesh.

Treatment.—℞. Pulv. Antimon:
Gum. Acaciæ,
Sacch. Albi., $\overline{aa}$ ℨi.

Misce. ft. pulv., and divide in chartulas 12. Take one, followed by simple water, before each meal, and at bedtime. Two teaspoonfuls Epsom salts, and six tumblers from the iodine spring every morning, early. A hot-bath daily, of fifteen minutes, at 110°.

August 21st.—Pulse seventy-two, and soft. Tongue improved surprisingly. Has taken ten tumblers from the iodine spring, mornings, in addition to his salts, without the least oppression or colic, and with free evacuations.

August 24th.—Pulse sixty-six, and easy. Cough much diminished, and loose. Free bowels. Fur on tongue nearly gone. The hot bath agreeable; is uniformly followed by free perspiration, several hours. Still finds ten tumblers agreeable, and thoroughly cathartic and diuretic. The secretion of urine, regular and abundant. Has no need of the sulphate of magnesia. Appetite strong.

Mr. B. gained so rapidly, that he soon left for home. On his arrival there he soon began to lose ground, although he had a full supply of iodine water in bottles, and took it liberally. It soon occurred to him that he was indebted chiefly to the hot baths for his rapid amendment here. He wrote me that he recommenced the use of the hot water in a rude tub soon after; and his improvement was so unequivocal that he was about constructing a regular bath,—and if that did not produce the wished-for effect, he should immediately return to Saratoga. As I have heard nothing from him since, I conclude the bath, which is often ranked as an auxiliary, and often an ambiguous remedy, became to him the primary and efficient means of his recovery.

CASE II.—*Scrofulous Ulceration in various parts of the body, accompanied with Exfoliation of the Bones.*

August 23d, 1839.—J. S. K., from Boston, aged seventeen. Four years since, had what was called typhus fever. Since then has had ulcers in various parts of the body. Has had an ulcer on the upper part of the thigh steadily for three years. The opening fistulous, with a suppurating cavity of several inches around the fistula. The pus thick and yellow. Had hip disease five weeks last spring. Treated by Dr. Haywood. Could not touch his foot to the ground. At one time had stiff neck four months. Pieces of bone have come out from various places. Appetite poor. Pulse eighty-six, and soft. Tongue foul. *Treatment.*—The iodine water taken every morning at the spring, sufficient to prove mildly laxative. Also, one tumbler from the Flat Rock chalybeate spring, at 12 M., and at 5 and 9 P. M. In addition to these, a bath of mineral

water every second day, for fifteen minutes, at 110°.

August 27th.—Pulse ninety-two, and soft. Tongue clean. Baths agreeable after the first three or four minutes.

September 17th.—Can walk two and a half miles as easily as half a mile when he arrived. Has much more vivacity, as well as strength. Increasing in flesh. Feels every symptom of convalescence. On his own responsibility, guided by his own perceptions of the efficacy of the baths, he increased the temperature to 112°. Continues the iodine and Flat Rock waters. Expects soon to return home, with a full determination to spend the ensuing summer in Saratoga.

CASE III.—*Inflamed Prostate.*

September 14th, 1839.—Gen. R., from Connecticut, about fifty or fifty-five. Had a severe and dangerous inflammation of the prostate gland last March, which caused total retention of urine. At the end of five days, after many trials with the catheter and bougie had failed, five quarts (!) of urine were drawn off by a catheter of peculiar construction. Since that time Gen. R. has been feeble and very bilious. No return of the constitutional powers, although the obstruction is not now troublesome. Pulse seventy-eight, and hard. Face sallow. Vomits bile. *Treatment.*—Two blue pills at bedtime for three nights: afterwards, one a night. Six to eight tumblers Congress water in the morning. Bath every second day from 90° to 96°.

Sept. 25th.—Pulse rather wiry. Some pain in the shoulder. Sallowness of countenance wholly removed. Eats and sleeps better.

℞.—Sub. Mur. Hyd., gr. 1½.
    Opii,   gr. ⅜.
Ft. pilula, sumenda hora somni.

One piling teaspoonful of calcined magnesia, and three tumblers Congress water in the morning. Omit blue pill.

The patient left a few days after this date, very much improved. When he arrived, had the assistance of his wife's arm in ascending stairs; now walks vigorously, alone, up hills, and at considerable distances. As the new movements produced in the animal economy by these waters often continue many months after the invalid leaves us, it is all but certain that this gentleman recovered his usual health in the course of the autumn.

CASE IV.—*Chronic Colitis.*

September 11th, 1839.—Mr. J. L. C., of Georgia, say thirty-five years of age. Has had fixed pain in the right side for years, passing up to the right shoulder. This pain was preceded many years by chronic diarrhœa. Tongue furred. Great variety of alvine evacuations. Has constant uneasiness around him in the region and direction of the diaphragm. Pulse fifty-six, and easy. Has passed five summers at the Virginia Springs. Pain at epigastrium, in the region of the great arch of colon, not relieved at the Springs, but thinks he passes the following winter better for his visit in the summer. *Treatment.*—An opium and calomel pill, night and morning. A hot bath every evening at 8, going thence to bed. A bottle of Congress water in the room while dressing, and three tumblers at the spring, all before breakfast.

Sept. 13th.—Bath agreeable, at 100°. Thorough cathartics. Some griping.

Sept. 17th.—Has so little pain now, that without my direction, omitted calomel and opium pills. Felt languid and feeble while in the bath, but this was followed by a fine glow and very comfortable sensations for many hours. Appetite decidedly better. Pain of colon "almost forgotten."

Sept. 19th.—Although no opium since 15th, pain scarcely felt. Is entirely free from it most of the time. A decidedly improved feeling through the abdomen, every way. Operation of the water very easy and generous. The baths highly agreeable, and he determines to construct a bath at home. Skin more natural.

Sept. 21st.—Bath yesterday at 102°, very grateful. Still improving in every respect. Left soon after, on account of the lateness of season and the approach of business, resolving to spend the whole of next summer here if his health should not be fully restored by the restorative effects of the waters already used.

CASE V.—*Enlarged Tonsils.*

This case being that of a boy from one of our western cities, is detailed in a small book just published, entitled "Saratoga Waters;" and is alluded to here to call the attention of the faculty to those instances of this affection where excision of the tonsils fails through general derangement of the system. This boy was left, for the summer, under my care, and fully recovered, going home with a new constitution. He lost no time in his education, being placed in one of our academical schools. The water was taken as an alterative, combined with a daily shower bath.

CASE VI.—*Chronic Affection of the Brain and Spinal Marrow.*

July 26th, 1839.—Mrs. P. C., from Connecticut, aged about thirty-seven. Has at times lost her reason. Has continual *cephalalgia.* Her whole arms feel permanently as others' feel when they have "hit their elbow." Numbness of lower extremities, and great loss of muscular power. Amenorrhœa. Pulse good. Wakefulness. Indigestion. She was directed to take ʒi. antimonial wine at bedtime, and from six to eight tumblers Congress water in the morning.

Aug. 13th.—The use of the water has produced a wiry pulse, and great pressure of the

head, and stricture of the lungs.   After bleeding her 16 oz., I put her on an active course of purgatives, antimonials, extract of hyosciamus, &c., suspending the Congress water; and, in two or three weeks, she was rapidly convalescing, and left here with such health as she had not known for years.   Although the Congress water proved too tonic, it may have effected a condition of the fluids and solids that enabled the common remedies to have much more power than before her trial of the waters.

CASE VII.—*Chronic Affection of the Brain and Spinal Marrow.*

August 1st, 1839.—Miss J. S., a single lady, aged twenty-seven, an adopted daughter of a gentleman in one of the cities of this state. Has been an invalid since the age of 17.   For the last seven years nearly helpless, and for the last four years has constantly had a special nurse.   If she rides out, she is carried to and from the chaise by her adopted father.   She spends the day in a cradle made expressly for her.   If she journies, this must form part of her travelling apparatus; and in this cradle I always found her when I paid my visits to her in this village.   She converses in a whisper. The optic nerves are so exquisitely painful, that she lies much of the time with her fingers pressing on her eyeballs.   The nerves generally are neuralgic.   All her senses morbidly acute.   So is the memory.   She recollects, verbatim, the letters she wrote five years ago. Pulse seventy-four, soft, equable.   Nothing morbid in tongue or countenance.   Digestion, a cypher.   Catamenia failed a year since.   Her nights very tedious.   Has tried many remedies and expedients suggested by the untiring kindness of her friends, and patience of her physicians.

To remove this long-continued and formidable disease, two things were attempted: 1st, to institute a revulsion from the cerebro-spinal system; and, 2d, to administer the mineral waters as an alterative and tonic during the action of these revulsive remedies.   The first indication was fulfilled by, 1st, a hot bath, every second day, of 110°, made of the water from the saline fountains, and continued fifteen minutes.   The operation of these baths was unequivocally pleasurable and refreshing at the time, with the exception of some languor during the first hour.   As they were followed by several hours' free perspiration, and as several pounds of extra blood were confined in the cutaneous vessels during the same time, it will be very apparent that these hot baths must have formed a powerful counteraction to the disease of the nervous apparatus.   They appeared, moreover, decidedly beneficial to the patient at the time.   2d. An efficient and continued perturbation of the stomach, liver, and bowels, by daily doses, in the morning, of magnesia, rhubarb, and some carminative.   3d.

Small doses of opium and calomel, to diminish the extreme susceptibility of the nerves and her general neuralgic sufferings; to produce a new action in the liver, and augmentation of bile; and, also, to cause direct revulsion from the brain by a temporary, factitious inflammation of the membranes of the mouth by ptyalism.   4th.   Several doses daily of camphorated tincture of opium and antimonial wine, to produce perturbation in the stomach, liver, and upper parts of the alimentary canal.

While these multiplied impressions were being made on the whole muco-cutaneous surface, and upon the chylopoietic viscera, the second indication was fulfilled by her taking, before each meal and at bedtime, one or two tumblers of water, fresh from the Congress spring, as an alterative and tonic.   This quantity probably lingered longer in the circulating mass, and effected greater changes in it, than three times the quantity would have done.

By the 15th of August, it was evident the patient had imbibed strong hopes of recovery. Every symptom was improved.   Her *sensations* were new, and full of evidence of a favourable modification of all the processes of the system.   After staying a few days longer, she returned home; and the progress of her recovery to a late date, is detailed in the following letter from her uncle and adopted father to myself:

MARCH 10, 1840.

Dr. North—Dear Sir: Without any apology for my long delay, I will proceed directly to my object of informing you of the health of your patient of last summer, Miss J. S.   You will recollect her and her cradle at Wilcox's. Soon after her return, she repeated the salivating course she had pursued under your prescription in Saratoga, though I believe you thought the repetition unnecessary.   On the whole, she has been improving from that time to this.   She has taken her hot bath almost every day since she left you; and, for four months past, has taken nearly the same kind of food with the rest of the family.   Tea, fat pork, and sometimes beef in small quantities, potatoes, bread and butter, are among her articles of diet.   Exercise in the open air almost daily, not excepting the coldest days of winter, by riding in a covered sleigh, and late last fall sometimes on horseback, has been rigidly enforced.   She has performed some short journeys.   Her lungs and chest are in such a state, that she can and does talk a good deal.   She dismissed her cradle late in the fall.   She sits up sometimes several hours together.   Her common practice is to spend the day in alternately sitting up an hour or two, and then lying down.

To-day she and I had quite a game at battledoor, although this was not the first time of *her* performing it.   She was able to continue it a few minutes with great sprightliness.   I forgot to mention that at one time last fall she

rode seven miles on horseback. I have great hope she will ultimately recover comfortable health. * * * She thinks the *hot* bath has been particularly efficacious to her relief.

Respectfully yours,   H. C.

MEDICAL COLLEGE OF PHILADELPHIA.

In conformity with the provisions of the charter of incorporation of the Medical College of Philadelphia, the following officers have been duly elected by the College:—

President.—Thomas T. Hewson, M. D.

Vice Presidents.—Thomas Harris, M. D. Charles D. Meigs, M. D.

Treasurer.—Henry Bond, M. D.

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Board of Examiners.

Jacob Randolph, M. D., Charles D. Meigs, M. D., for one year.

D. F. Condie, M. D., Robert Bridges, M. D., for two years.

Reynell Coates, M. D., Caspar W. Pennock. M. D., for three years.

BIBLIOGRAPHICAL NOTICE.

I.—*Statistical Account of the Cases of Amputation performed at the Pennsylvania Hospital from January* 1, 1838, *to January* 1. 1840. By G. W. NORRIS, M. D., one of the Surgeons to the Institution.

II.—*Statistics of the Amputations of Large Limbs that have been performed at the Massachusetts General Hospital; with Remarks.* By GEO. HAYWARD, M. D., one of the Surgeons to the Hospital.

WITHIN the last few years, to the surprise of some of our surgical brethren, and amongst others to that of myself, it has been ascertained that the mortality after capital amputations was much larger than appeared at first sight. Many of us were under the impression that these operations were extremely insignificant, so far as the mortality was concerned. One of the editors of the Examiner laboured under this impression, and stated his convictions to some of his surgical friends at Paris; after his return to America, he found that the amputations at the Pennsylvania hospital were very often fatal; that is, during a portion of the period alluded to by Dr. Norris as that of greatest mortality after amputations, (1834–6.) Dr. Norris was also misled, trusting to his recollections of the mortality during a short period. On his return to America he has examined the records of the cases at the Pennsylvania hospital during a period of ten years, and finds that the mortality was very considerable, but varied at different parts of the ten years, being at times very small and at others very great.

At Boston, the mortality has, on the whole, been less considerable, but still is much greater than would have been believed by many who were not accustomed to look to accurate statistics as their guide.

The following extracts from the two papers will give the important facts contained in them.

We begin with Dr. Norris:

"Of eighty amputations on seventy-nine patients, performed during a term of ten years at the Pennsylvania Hospital, thirty-five were primary, of which twenty-four were cured, and eleven died, four of the deaths occurring within the twenty-four hours immediately following it.

Twenty were secondary, of which thirteen were cured and seven died.

Twenty-five* were for the cure of chronic affections, of which twenty were cured and four died.

Thirty-two of the amputations were of the upper extremity, of which twenty-seven were cured and five died.

Forty-seven were of the lower extremity, of which thirty-one were cured and sixteen died.

Seven were amputations at the joints, of which four were cured and three died.

Of the seventy-nine operated on,

13 were under 20 years,	of whom 12 were cured,	1 died.
26 were between 20 and 30,	of whom 19 were cured,	7 died.
22 were between 30 and 40,	of whom 15 were cured,	7 died.
16 were between 40 and 50,	of whom 9 were cured,	7 died.
2 were upwards of 50,	of whom 2 were cured.	
79	57	22

The conclusions to be drawn from an analysis of the two tables which 1 have now published are,

1. That amputation† with us is to be regarded as an operation attended with much danger to the life of the individual, the mortality after it being 1 in 3 7-11ths.

2. That the chances of success after it are much greater in persons who have been for some time suffering from chronic diseases, than in those who have it done while enjoying robust health, the mortality in the former class of cases being 1 in 6¼, while in the latter it is 1 in 3 2-11ths.

3. That immediate amputations after injuries

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* One double.

† The great amputations only, it will be recollected, are alluded to. No death has followed any of the amputations of fingers, or toes, which have been made in the hospital during the ten years past.

are less fatal than secondary operations, the mortality after the former being 1 in 3 2-11ths, while in the latter it is 1 in 2 6-7ths.

4. That amputation of the lower extremity is much more fatal than that of the superior member, the mortality after the former being 1 in 2 15-16ths, while in the last mentioned class of cases it is only 1 in 6 2-5ths, and

5. That the danger increases with the age of the individual operated on."

Dr. Hayward agrees in most respects with the conclusion of Dr. Norris. His remarks are:

From this table it appears, that there were seventy operations on sixty-seven patients; three patients having two limbs removed. In one of these three cases, one operation was above and the other below the knee, and in the other two, both operations were below; the first patient died, and the other two did well.

Of the whole number operated on, fifteen died and the remainder recovered, at least so far as to be able to leave the hospital; though it is probable that in some instances the disease may have returned.

There were thirty-four patients who had the thigh amputated, and one of these had the other leg taken off at the same time below the knee; of this number, nine died. Of twenty-three patients whose legs were amputated below the knee, two having both legs removed, five died; and of the ten who had an arm amputated, six below and four above the elbow; one died.

This goes to confirm the prevailing opinion among surgeons, that amputation of the lower extremities is more often followed by fatal consequences than that of the upper, and that death takes place more frequently after amputation of the thigh, than after that of the leg. More than a quarter of those whose thighs were amputated died, while there was but little more than one death in five among those whose legs were removed below the knee, and only one of the ten whose arms were amputated. This patient too died of delirium tremens. The operation to be sure did not arrest the disease, but apparently contributed nothing to the fatal result.

This table tends also to support the opinion, that patients who undergo amputation for chronic diseases are much more likely to recover than those in whom it is performed in consequence of recent accidents. Of the first class, there were forty-five patients afflicted with various diseases, and of this number all recovered but six; and of the remaining twenty-two, whose limbs were removed on account of recent injuries, no less than ten died; being nearly half of the latter and less than one in seven in the former.

This fact certainly gives support to the opinion, that a state of high health is not favourable to surgical operations; and it also tends to show that death after amputation is not by any means attributable in all cases to the operation alone; for if it were, the proportion of deaths should be as large among one class of patients as among the other. There can be no doubt, I think, that the result is influenced very much not only by the age and constitution of the patient and the disease or injury for which the operation is performed, but also by the period at which it is done. I have before said that I thought that amputation was 'often performed when it might have been avoided.' But this remark applies principally to cases of recent injury. In those of chronic diseases of the limbs, the error is more apt to be of the opposite character; the operation is either not performed, or if done at all, frequently not till it is too late. It cannot be denied, I think, that there is a disposition at the present day to defer amputation too long in cases of diseased limbs; there is an unwillingness to admit that the morbid affection is beyond the reach of remedies, and the operation is too often postponed till other parts become affected, or the system is worn down by continued irritation. At length the limb is removed; but the patient, already exhausted by disease and long suffering, is hurried to his end by the very means that might have saved him, if they had been earlier employed.

If amputation is frequently too long delayed in chronic diseases of the limb, it is, I fear, very often resorted to in recent injuries earlier than it should be. Many limbs that have been removed, might probably have been saved; but where this cannot be done, it is rare that much inconvenience would follow from a little delay.

In most cases of accident sufficiently severe to justify amputation, the whole system has suffered a great shock, and an operation at this time, before reaction is fairly established, is very likely to cut off what little chance the patient might otherwise have of recovery. While the extremities are cold and the action of the heart is feeble, the local injury is hardly, if at all, perceived, and adds nothing to the patient's sufferings. An operation cannot be required then; and yet how often it is done at that period; the better judgment of the surgical attendant sometimes being overruled by the importunate interference of the bystanders.

If the injury be not so serious as to cause almost immediate death, reaction usually comes on with proper management in a few hours, and then, if an operation be necessary, it can be done with a much greater prospect of success.

With regard to the ages of the patients operated on, it appears that there were

	Under 20	years	13,	of this number	1	died.	
Over 20, not exceeding	30	"	31,	"	8	"	
" 30,	"	40	"	9,	"	3	"
" 40,	"	50	"	10,	"	2	"
" 50,	"	60	"	3,	"	1	"
	Over 70	"	1,	"	0	"	

Whole number, 67. No. of deaths, 15.

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The combined results are as follows:

Of 124 cases of amputation, 37 proved fatal, or a fraction more than 1 in 4. This mortality of one-fourth in the amputations in the two hospitals which are perhaps placed upon a better footing than any others in America, shows the great mortality, whether this results from the operation or from the cause which rendered it necessary. The results of Mr. Benjamin Phillips are founded on a collection of 640 cases, and give a mortality of 1 in 4 4-15ths, a little less than that of the American statistics, but probably not differing from it if the calculation were based on a larger number of cases. As we shall presently show, the excessive mortality at Paris does not follow amputations at all the hospitals, but is confined to those most unfavourably situated.

These statistical accounts are of great value, as exhibiting the gravity of an operation, the dangers of which have been so generally underrated, and we trust that they will be continued, as from the variableness of the results during the different years, we think they should embrace a still longer period, before we can decide, with sufficient accuracy, upon the average mortality in our own hospitals; and that they should be compared with similar statistics from European hospitals before venturing to claim for ourselves a greater proportional success. Thus, Dr. Hayward mentions, " It has been stated that more than one-half of all whose limbs are amputated at some of the hospitals of Paris, die." This statement is probably not founded on regular statistics, and, although we do not doubt its correctness in the case of a single hospital, (the Hotel Dieu,) yet there are other hospitals that occasionally offer a brilliant contrast to this sad picture, and, by their success, diminish the average mortality many-fold.

Thus, during the year ending August, 1837, there occurred in the service of Velpeau, at "la Charité," eleven amputations of limbs, distributed as follows: Of thigh, three; of leg, four; of foot, one; of arm one; of forearm, two; of these ten recovered, and only one, an amputation of the leg in the articulation, died. But as this remarkable degree of success would not be admitted as the basis of a comparison between the results obtained in the two countries, so neither should the frequent failures in one or more of the unhealthy Parisian hospitals, be assumed as giving the average mortality in that city. Statistics from all their hospitals, for a number of years, must be compared with our own, before we can arrive at truth; and, we believe, could the Hotel Dieu be excluded from the account, that the difference in success would not be so much in our favour as is generally supposed.

But, valuable as these statistics are in their present form, we conceive that their value would be infinitely enhanced by a few additional details. They prove, beyond a doubt, the great risk to life attendant upon the operation, a risk not hitherto appreciated. They demonstrate, by a rigid calculation of numbers, that, of all those subjected to amputation of a limb, more than one quarter die. But an acquaintance with this fact is but of moderate *practical* importance to the surgeon (except as inducing him to refrain from amputations of "complaisance,") so long as it is unaccompanied by a knowledge of the immediate causes which lead to a fatal termination.

Amputation cannot be proscribed as an operation, nor can its frequency be even greatly diminished. Circumstances will continually render it indispensable, whatever may be its dangers, and hence the great importance of examining upon what its dangers depend, of learning, in a word, what is the common cause of death after a great amputation. We have been led to ascribe it, in a large majority of the fatal cases, to a purulent resorption, or a purulent phlebitis, in which the veins of the medullary membrane are the efficient agents. Thus, out of thirteen great amputations occurring during a year in the hospital of St. Louis, five were cured and eight died; of these, six were examined after death, and five out of the six presented metastatic abscesses of the viscera; the sixth died of hospital gangrene. Subsequent examinations in this city tend to confirm the opinion, that a large majority of those who die after amputation of a limb, die from a chemical decomposition of the blood consequent upon the admixture of purulent or gangrenous matter with this fluid. But statistics alone can settle this point. How important, then, to append to the valuable statistics already furnished, the causes of death in the fatal cases, whenever they can be procured. For in a knowledge of these causes consists the first step towards a rational plan for diminishing the amount of mortality.

In connexion with this subject, we may advert to the fact, that without ever appearing as an actual epidemic, metastatic abscesses are, in some years, a more frequent consequence of amputation than in others, and appear to be somewhat under the control of atmospheric or other influence ; thus probably, " cœteris paribus," accounting for the variableness of success in different years, in confirmation of which we may mention, that the late success in amputations at the Pennsylvania Hospital, coincides with a similar happy termination of compound fractures of the thigh, which so generally prove fatal, and almost constantly from this cause.

Another important addition to the statistics as they are now offered, would be the mention of the point at which the bone was sawed, in order that we might judge whether the nutritious artery was severed in its canal, and the medullary membrane thus deprived of its supply of blood, and what influence this section of the artery might have upon the subsequent necrosis of the bone. The great frequency of this necrosis in the Parisian hospitals is notorious. M. Reynaud states, that during two years, in the service of M. Roux, every amputation of the thigh, without exception, died, and in almost every instance he was able to recognise this affection of the bone of the stump. He, together with Serre of Montpelier, ascribes it to the action of the saw on the medulla, producing an inflammation which, being imprisoned, causes strangulation of the vessels and the death of the bone; the latter asserting that, during three years that he has employed a saw with fine teeth, the accident has never occurred. To statistics, again, we must look for a correct decision upon this subject.

But the point at which the amputation is performed in the leg, has, at the present moment, an importance of an entirely different character. Since the introduction of the artificial leg of M. Martin, which offers a very perfect substitute for almost all the natural motions of the foot without pressing upon the stump, but requires that this stump should be sufficiently long to act as a lever, it becomes the duty of the profession to decide upon the comparative dangers of an amputation at different points of the limb ; and if, as it would appear, the dangers of amputation are absolutely less in proportion as we approach the ankle, it

must lead to the establishment of a law, entirely subversive of the practice now generally pursued, viz., in an ablation of the lower extremity, to amputate as near the ankle as circumstances will admit. Upon the comparative dangers of the operation in different points of the limb, statistics alone can enlighten us, and we are induced to hope that those who have already done so much for the profession, by exhibiting the serious character of a great amputation in its true light, will go still farther, and elucidate those points upon which the gravity of the operation depends.   W. P. J.

FOREIGN SUMMARY.

PHILLIPS' LECTURE ON THE PRINCIPLES AND PRACTICE OF SURGERY.—NO. IV.

CANCER—(Continued.)

Treatment continued—Cauterization—Excision.
MELANOSIS. — *Nature — Varieties — Fluid—*
    Structure — Formation — Symptoms— Diag-
    nosis—Prognosis—Causes—Treatment.
WOUNDS.— *General Principles — Varieties —*
    PUNCTURED : *Puculiarities — Prognosis —*
    *Treatment—*INCISED: *Peculiarities.*

Cauterization.—Many different modes have been employed in the use of cauterization ; we may use the actual cautery or different forms of caustic—such as chloride of antimony, nitrate of silver, arsenic, caustic potash, nitrate of mercury, chloride of zinc, creosote. I think they are only applicable to cases where the disease affects the skin or mucous tissues alone ; where the morbid structure, at its base, is not thick, and where two or three applications of the caustic are sufficient to destroy it entirely : they may sometimes repress vegetations, and determine upon the scirrhous base the formation of cicatrices. But these " cures" are only temporary; the ulcer will commonly reappear at the point where it was before seated. When more than one application of caustic is necessary, there is always danger that the irritation will give the tumour unwonted activity; therefore is it that it has been found most successful in those of the face ; in the breast, or other gland, it should rarely be used, except in those cases where some portions remain after excision. Where caustics are admissible, many persons believe them preferable to the knife; it is said that relapses are less frequent after them. I object to the red-hot iron, because, if the surface be an irregular one, it cannot be applied to all parts of it, and because it too soon forms an eschar, by which its action is limited.

Excision.—The removal of cancer by a cutting instrument may be done by extirpating the cancerous mass alone, or by removing a

limb upon which it is seated; and it is, no doubt, of all means the most efficacious. If it be judged necessary, it may be well that it should be preceded by leechings: the surrounding tumefaction is thus reduced, and the extent of the tumour more exactly defined; although the operation affords more chance of cure than any other, it is not easy to think that it justifies excision of the uterus, the rectum, &c. All operations are principally recommended from a belief of the occasional curability of the disease. A large number of persons regard it as incurable; and, to be consistent, the patient should be generally abandoned to the suffering of a horrible disease, and to inevitable death. It is, however, important, neither to deceive ourselves nor others with the results of operations. A case apparently the most simple, small, and circumscribed, completely removed locally, may rapidly reappear; whilst a very unpromising case sometimes does well. It is our duty to bring to bear all the resources of art, not to shrink from any difficulty, in attempting to rescue the patient from impending death; but we should hold out few hopes, nor encourage many fears, as to the results of such operations which we feel bound to undertake. In what cases, it may be asked, are we justified in operating—what in refusing? We shall be justified in hesitating, from the small prospect of success, when the tumour is large—when the neighbouring glands are tumefied, the surface ulcerated, and the constitution bears evident marks of suffering: but any of these circumstances taken singly may not be enough. The fundamental principle by which the surgeon should be guided, is the possibility of removing all the morbid structure. We may not succeed even when this is accomplished; we cannot, if it be not.

When no operation can with propriety be performed, we must seek to palliate suffering. The first element is diet; which should be rather vegetable than animal, and as little stimulating as possible. The bowels should be attended to, the patient should be warmly clad, and kept as free as possible from mental or bodily excitement. Pain may be lessened by opium and cicuta internally, by opiates and belladonna externally. The surface of an ulcer may be cleansed and purified by the chlorides, by decoction of bark, tincture of myrrh, alum, acetic or hydrochloric acid, charcoal, or carot, or yeast cataplasm. Hæmorrhages, which sometimes quiet pain, should be restrained if abundant. Pressure is sometimes enough for the purpose, but the red hot iron is sometimes necessary.

MELANOSIS.

After Laennec, we understand, by melanosis, a pathological production deposited upon the surface or in the substance of organs, of a darkish or blackish colour, having no analogy with the healthy tissues of the body. How long this affection has been known, it is not very important for us to inquire: whether those passages in the works of Hippocrates, referred to by Bartholin and Lorry, can be admitted as indications that he knew the disease, is immaterial. I take it there can be no doubt that the case published by Highmore, in 1651, was melanosis. The disease which was described by Blugnoni, in 1781, which was hereditarily transmitted among the white horses of Chevasso, and which he termed hemorrhoids, was evidently melanosis; it was usually developed around the root of the tail and the anus. Some years later (in 1784,) the same disease was observed at Bresse. Gollety-Latournelle transmitted an account of it, in 1809: he says, " there supervened in a young stallion, on the second year of his covering, black " boutons," or buds, around the anus; they soon extended to the scrotum and sheath; they were placed between the skin and muscles, at first as large as a small nut; they increased until they attained the size of a pullet's egg; they did not supperate, and were insensible to the touch. In a short time, all the cellular tissue was similarly affected, and the animal died. When cut into, a matter like the grease of a cartwheel flowed out. All the progeny of this stallion which had the same colour were similarly affected; those which were black, bay, roan, or iron-gray, escaped. In 1806, Laennec communicated to the faculty the result of his observations on the same subject. The subject was further elucidated by Breschet, in 1821; by Noack, in 1827; by Frousseau and Leblanc, in 1828; and by Carswell, in 1834; but much still remains to be done for it.

Varieties.—Laennec admitted two successive states in this disease; that of " crudity," and that of softening. In the first, it is a black, opaque, homogeneous mass, of the consistency of lymphatic glands; in the second, pressure causes the exudation of a darkish-red fluid, having very small blackish particles mixed with it; and when this softening is complete, it is converted into a black semi-fluid mass not unlike China ink, or the fluid of the cuttle-fish. It may occur in masses, surrounded or not by a cyst; may infiltrate an organ—may be deposited on surfaces—may be fluid, effused into cavities. When in masses, the tumour is variable in size; from that of a grape-seed to that of a hen's egg. Gohier saw one on a horse weighing thirty-six pounds: this might have been formed by the aggregation of many smaller ones. It is said that some of these tumours enlarge greatly, if the patient be placed in a bath. The colour of these masses appears, in many cases, to vary with the period of its development: at an early period they are of a reddish brown; they become darker, violet, very dark indigo, and sooty. The skin covering these tumours at

first retains its natural thickness, but is gradually thinned, until only the epidermis remains, which, after a time, becomes dry, rugous, horny. With respect to the existence of a cyst at all, many doubts are entertained; some persons arguing that what is described a cyst is merely a condensation of the surrounding cellular tissue. This membrane, whether it be called a cyst or not, is, according to Breschet, together with the processes it sends into different parts of the tumour, the only organized part which he has observed; he could discover no vessel—no nerve; his injections were also arrested in this membrane, and did not penetrate into the black matter; but he has sometimes seen the injection extravasated with the black matter in the cells. The matter which constitutes these tumours when they are not infiltrations, varies much in consistency, from that of pitch to that of tar. If we rub it on linen or paper, in some cases, the tint is so like bistre that it may be used instead of it. Breschet says this matter is inodorous and almost tasteless. Noack, Gohier, Gasparin, and Flandrin, state that the odour is very sickly and disagreeable: this is my own observation; but I have only examined it on the dead body, and decomposition may have had something to do with it. Breschet says it is soluble in water and alcohol; exposed to the air, it putrefies very slowly. This is owing, Noack thinks, to the quantity of carbon it contains. The whole or part of an organ may be infiltrated with melanotic matter, which then fills up the cells or interstices of the tissue, but it is pretty certain that many cases termed melanomia are chronic phlegmasia. Indeed infiltrated melanosis is very rare even in those cases where the disposition to produce the disease is very decided. It is occasionally found deposited upon certain surfaces, the peritoneum for instance, but oftener it will be found in the subserous tissue. When the black matter is not too concrete, the surrounding blood-vessels seemed filled with it. Breschet thought it was situated in the arteries; Noack thought it was especially found in the veins.

With respect to this melanotic fluid, some persons seem inclined to believe, that the black matter thrown up from the stomach in certain cases of acute or chronic inflammation of that organ was sometimes melanotic matter; it seems to me more probable that it was effused blood acted upon by the gastric fluid. Prout attributes to melanic acid the colour of urine in some cases where he has seen it of a deep black. The fluid is composed, after Jacquet, of water, carbon, iron, and phosphate of lime. Thenard believed it to be essentially formed of carbon; Laissaigné coloured fibrine, black colouring matter soluble in dilute sulphuric acid, and in a solution of subcarbonate of soda, (which reddens it) a little albumen, chloride of sodium, subcarbonate of soda, phosphate of

lime, and oxide of iron; in fact, with the exception of the black colouring matter, not unlike the composition of the blood clot. Foy's analysis is as follows:

Albumen, - - -	15.00
Sub-phosphate of lime, - -	8.75
Water, - - - -	18.75
Fibrine, - - - -	6.25
Hydro-chlorate of potash, -	5.00
—————— of soda, - -	3.75
Carbonate of soda, - -	2.50
——·—— of lime, - -	3.75
——·—— of magnesia, -	1.75
Oxide of iron, - - -	1.75
Tartrate of soda, - -	4.75
A principle, eminently carbonized, probably altered cruor, - -	31.40
	100.00

The analysis therefore shows the absence of fatty matter which is found in encephaloid productions, and exhibits a large proportion of all the materials of the blood.

Structure.—Much doubt still exists with regard to the nature of this product, and even whether it be a tissue. Laennec believed it to be an accidental tissue. If we examine melanosis in masses, no tissue-like appearance can be seen. Breschet could find no vessel, no nerve, no fibre, in these masses; he could not therefore agree with Laennec, Meckel, and others, in regarding it as a particular species of cancer, though he would probably admit that a cancerous mass might be infiltrated with melanotic fluid. I cannot subscribe to this opinion, though it be true that the black matter has been found in tissues disorganized to the last degree—though it has been observed in carcinoma of the eye. In all these cases there is, I suppose, only an accidental deposit of black matter in an accidental product. If this matter constituted one of the characters of cancer, we should regard as cancerous all parts where it is found deposited. Now what analogy is there between cancer and those black spots which we see on the peritoneum, the pleura, and the pericardium? Some persons regard it as a disease of the cellular tissue: no doubt melanotic matter is very commonly deposited in it. Many persons are of opinion that the black principle is an aberration of the pigment destined by nature to be deposited elsewhere, as the rete mucosum, the choroid, the hair; it is said that persons with light hair, and elderly persons whose hair no longer obtains the same quantity of colouring matter as it did in youth, as well as light gray or white horses, are most commonly the subjects of the disease; at the same time it must be admitted that it is by no means a universal rule. Beheir has seen melanotic matter in a nævus tumour; in this case tumours existed over the greater part of the surface, and the interior of the body, and the inclination on his mind was, that they were originally extravasations of blood, as in

purpura; that they afterwards underwent particular changes; they were redder as they were more recent. Biett mentions another case in which an irritated nævus became the seat of similar deposition, which afterwards occurred in different parts of the body. I believe that this matter is the colouring and fibrinous portions of the blood in a particular state of alteration. Breschet pointed out its analogy with the choroid matter, that of the uvea, the placenta of some carnivora, the rete mucosum of the negro. He and Noack believe that the disease is a consequence of the accumulation in the blood of that carbon which was destined to colour certain tissues and organs. Assuming this as the most probable explanation of the formation of these tumours, it may be further assumed, that melanosis in masses is produced by the effusion of blood into the cellular tissues. Melanosis may affect most of our tissues and organs, the skin, the cellular system, the vessels, the lymphatic glands; Lobstein thought that the nerves were more surrounded than penetrated by it. Among the parenchymatous tissues, Fawdington, Halliday, Cullen and Carswell, have seen it affect the heart: the lungs, the liver, the pancreas, and the ovaries, are the most frequently affected. I am not aware of any case in which it has been deposited in the synovial membranes or articular cartilages. Halliday and Fawdington saw it affect many bones, Lobstein and Lauth have also seen examples: in a dead body dissected in this school last year it was found to affect many bones. The observations of Breshet and Cruveilhier, confirmed by those of Louth, seem to prove that this black matter had been found in blood vessels which had not been broken down. Treviranus, in some experiments on frogs, in which he interrupted the circulation in various ways, saw black, star-like points formed on the surface of many organs. Examined with a lens, these spots were found similar to the choroid pigment. In fact, it is most probable that melanosis is formed by the blood which has undergone a certain change; that the blood is even changed in the vessels themselves; that it is deposited in the tissue of organs by a kind of secretion analogous to that of the choroid and the black matter in the skin of the negro; from whence I conclude that it is not a sui generic pathological production, but a simple black deposit or colouring, sometimes of a healthy, sometimes of a diseased tissue, and sometimes of a tissue accidentally developed, such as a cancerous mass, and, therefore, that Laennec was in error in regarding it as a particular tissue.

Symptoms.—It seems questionable whether melanosis determines any special symptoms. Laennec believed it capable of gradually diminishing the vital powers, by altering the nutrition in parts of the body where it is deposited Noack believes that in infiltrated melanosis the symptoms should be referred rather to the disease which has excited the infiltration. Still there are cases in which melanosis is the cause of the phenomena observed when the functions of organs are constrained, either by compression, as in the lung or the brain, or by acting as foreign bodies.

Diagnosis.—In the diagnosis two circumstances only may assist us where the disease is internal—black avacuations, which at last are indecisive, and the existence of melanotic spots, in, or immediately under the skin. When subcutaneous, if sufficiently superficial to show their colour, the diagnosis cannot be difficult.

Prognosis.—As to the prognosis, what I have said of the symptoms must at once lead to the conclusion that the disease is comparatively harmless, unless it interfere with the functions of organs, and then the gravity must depend upon the importance of the organ. If this interference does occur, the existence of melanosis is often not revealed until after death. Of course the danger is greater as the disposition to produce the disease is more decided, and subcutaneous tumours are usually conclusive evidence of the disposition.

Causes.—As to causes we can say little; reasoning from analogy, I believe that similar causes to those which produce purpura—causes capable of producing a relaxation of the solids and of thinning the fluids, may facilitate the production of this disease—and as to hereditary transmission, if proved in horses, it has never been made out in man.

Treatment.—In the treatment of this disease we have no fixed rules. Noack says that bleeding in summer has diminished the sizes of these tumours, and arrested their development. When few in number extirpation has succeeded. Damoiseau cured a case in this way; but unfortunately extirpation frequently does not prevent relapse, either at the same or another point. Gasparin says he has succeeded in preventing relapse by using sulphurous fumigation after extirpation. But the effects of these means must be further tested before they can be ranked as remedial agents.

WOUNDS.

The violent action of all bodies harder than the tissues of our organs may overcome the resistance of those tissues, and produce a breach of surface or solution of continuity, or wound; for these are synonymous terms. If the solution of continuity affects the bony tissues it is termed a fracture.

Certain effects pretty uniformly accompany wounds, however they may be produced—pain, retraction of the edges, and hæmorrhage. The first varies with the quantity of sensibility with which the part is endowed. The second depends on the natural elasticity of the part—its extent being very variable; sometimes being scarcely sensible, at others, when the wound has implicated muscular fibres, being very

great, especially when a long muscle is implicated, such as the sartorius, which may contract a third of its length. In fact, the longer the fibres the greater the retraction, the more numerous the fibres the more powerful the retraction. The third depends upon the section or wound of blood vessels; and as all organs admit a certain number of vessels into their texture, a wound can hardly happen without the shedding of blood.

Union by " first intention."—Left to itself, nature soon sets in motion the action necessary to repair the injury: that action is inflammation. The pain proceeding from the injury is increased by contact of air, and the necessary action is developed. If the wound be small, and the lips not far removed from each other, the inflammation is inconsiderable, serous fluid is effused, it gradually acquires more consistency, assumes the character of coagulable lymph, forms a medium between the lips, becomes organised, and union is complete. This semi-fluid substance may very soon be distinguished upon the surface of a wound, so soon, in fact, as the surfaces are sufficiently inflamed to coagulate the serous fluid which is at first effused. Between serous surfaces it has been seen in four hours, after twenty-four hours it is white and areolar, after forty-eight hours it is pervaded by blood canals, and by the sixth or seventh day it is completely organised. If the parts have been exactly brought together this bond of union or cicatrix is linear, fibro-cellular; its colour after a time is whiter, and its power of resistance greater than that of the adjoining tissues. In this way a ruptured continuity is restored, vessels pass through the cicatrix, though now and then difficulty is experienced in demonstrating them. Hunter, Wolf, and others, have shown that the vessels in a cicatrix are not simple extensions from the divided surfaces, but newly formed vessels which inosculate with the old ones. Many cases might be referred to in proof that nervous reparation also happens. Some years ago a young woman had neuralgia near the point of the little finger; many means were tried and failed; at last her medical attendant made a circular incision down to the bone; the neuralgia was dissipated, but by the end of two months it began again to be felt, and in six months it had acquired nearly its former intensity. Union so acquired was called by Hunter "union by first intention." To afford the greatest probability of such union it is necessary, or at least advisable, that both surfaces should be living. I say advisable, because the chances of success are greater; I believe it is unquestionable that parts entirely separated from the body will occasionally unite, but then they must be small parts, such as fingers. Again, a wound should not have been very long exposed, otherwise suppurative action may be established, and all chance of immediate union is dissipated.

Baronio completely detached from each side of the loins of a sheep a flap three inches by two; he substituted one for the other, and at the end of eleven days found both united; another time he allowed eighteen minutes, and another an hour to elapse, before they were applied but the results were the same. Wiseman made similar experiments with similar results. Hunter transplanted the testicles of a cock, as well as the spur and teeth of other animals, and they became equally adherent. For many years such things were not believed, but the examples are now too numerous and too well authenticated to admit of doubt: observations of ends of fingers separated and completely united have been recorded by Heister, Flurant, Piedagnel, Sommé, Busley, Balfour, Wigord, Houston, Bonn, and others; in one case the part has been detached an hour and a half. Examples of a similar kind implicating the nose are detailed by Garengeot, Blegny, Fiorarente, Molinelli, Leyseri, Loubet, Percy, Carlizzy. Portions of the ear by Laurent, Magnan. Burdach speaks of a case iu which Lenhossek saw the ungual phalanx unite, Schopper saw two phalanges, Braun an entire finger, and adds that Marley and Lario had seen similar cases.

The precept which arises out of these cases is, that when the end of a finger, a nose, or an ear, is completely detached, if it be not much contused, if not more than three or four hours have elapsed since the accident, union should be attempted. In many cases it may be expected to fail, in a very few it may succeed. You must also bear in mind, that up to the present time these results have occurred only where very small portions of the body have been detached.

It is better also that there should be a similarity between the surfaces; but this is not indispensable: for instance, in excising a tumour, we remove a certain quantity of tissues, and similar parts do not come in contact, yet they heal by " first intention." The lips of the wound should not be severely contused, or suppurative action will most likely set in. Foreign bodies, such as a splinter, a ligature, a piece of linen, or any similar substance, will prevent immediate union, by setting up suppuration. A coagulum of blood, if thin, interposed between the lips of a wound, does not seem to constitute an obstacle to immediate union; Hunter, indeed, thought that " being endowed with life," it did not irritate; that the colouring and serous portions being removed, the coagulable lymph remained, was organized, and constituted the cicatrix," but in many cases it is hurtful. The general health and age of the patient, the period of the year, and a separation of the lips of the wound, may have material influence in producing or opposing union by first intention. With respect to temperature, Larrey, when in Egypt, was much struck with the rapidity with which wounds

healed. Guyon and Breschet have been engaged at the Hotel Dieu in making experiments on this subject, which strengthen this belief, and it is, I think, certain that wounds heal more rapidly under warm water dressings than under ordinary treatment.

Union by granulations.—Want of proper contact, loss of substance, disorganizing contusion, and the presence of a foreign substance, may prevent union by first intention, may excite suppurative action. In this case, when the hæmorrhage is suspended for a certain time, as before, a serous exhalation continues, inflammation becomes more intense, too intense for serous exhalation; it is therefore suspended; the surface becomes comparatively dry, the lips are tumid, dry, and painful; by the third or fourth day, varying however with the vascularity of the tissue, the surface again becomes moist; a reddish fluid is effused, and a concrete or coagulated fluid soon covers it; small red elevations (granulations) become apparent, and upon their surface a creamy fluid-pus may be observed. As soon as this fluid is formed the inflammatory action subsides, the tumefaction of the edges is much lessened. Whether immediately before or immediately after (for it is a debated position) the secretion of pus, those granulations are covered by a membrane which affords their delicate tissue a certain protection against external violence; this tissue was called by Delpech the pyogenic tissue or membrane, and the term is now generally used. The granulations increase in number and in consistency; they, or the membrane which covers them, are endowed with considerable retractile powers, by which the surface of a wound is much lessened. These bodies may become too luxuriant, may sprout above the surrounding surface, but unless they rise very high, a pellicle spreads over and represses them. This covering is at first very thin and red, but gradually becomes very resistant, and losing its vascularity, becomes white. The duration of this process is of course very variable.

Symptoms.—These processes cannot take place in the economy without developing certain general or constitutional symptoms; they are less decided, as might be expected, in wounds which heal by first intention than in those which suppurate. In each case they must necessarily vary with the extent of the wound, and the excitability of the patient. When the wound is disposed to heal rapidly, or is not large, the general excitement is very inconsiderable; but if the local disturbance be great, there is restlessness, heat of skin, and quick pulse. When adhesion commences these symptoms rapidly subside: in all this, however, there must be great variety. If suppurative action set in, the general symptoms are better marked—this action is not developed without some febrile disturbance, which is declared on the second or third day; rigors are first observed; the skin is hot and clammy,

the pulse quick, but not hard; the tongue is whitish. In ordinary cases this feverish action subsides after two or three days, the tongue cleans, thirst is abated, the appetite returns, and the disease is only local. If the patient be irritable and the wound large, the symptoms may be more serious, the feverish excitement may be more severe; there may be delirium, convulsions, spasms; these may be so great as to destroy life before suppurative action is established. If these first dangers be passed, all is not passed. If the wound be large, jagged, irregular, implicating important parts, phlebitis or other serious mischief may happen. The irritation of the wound may be so great, or the suppuration so abundant, that the system may give way under it.

Forms of Wounds.—A wound may be produced by many different agents; and these agents give peculiar characters to it. The agent may be a puncturing, incising, contusing, or lancinating instrument; it may be caused by projectiles from fire arms, by rabid or venomous animals, or it may be complicated by the insertion of peccant matter in the wound.

Punctured Wounds.—In a punctured wound only a very small extent of parts is divided, and those only corresponding to the point of the instrument; the rest are pushed aside, distended. Usually the disturbance is not great, and the wound is soon cicatrized. But it is not always so; I have known an acupuncture-needle introduced into the muscles of the calf of the leg, followed by violent inflammation and abcess. It is rare, however, that a puncture is made under such advantageous circumstances as that in acupuncturation; the blow is often sudden and violent, the instrument is not always sharp-pointed. The orifice of such a wound is usually narrowest, narrower indeed than the instruments by which it is inflicted. You must not always expect that the orifice will have the form of the instruments which have made it: this is an important circumstance for you to bear in mind in giving evidence. If, in a dead body, a puncturing instrument, with cutting edges, be made to penetrate perpendicularly to the surface, the teguments being equally tense on all sides, the wound will fairly represent the form of the instrument; but if the same instrument penetrate obliquely, or if the teguments be not equally tense on all sides, the form of the wound will no longer represent that of the instrument. If the instrument be merely pointed, and not cutting, it is usually impossible from the form of the wound to judge of the shape of the instrument: even though the instrument be exactly rounded, and be plunged perpendicularly to the surface of the teguments, the wound may be oval or angular. Indeed, the same instrument plunged into the body in half a dozen different places, may produce wounds of as many different forms. If the punctured wound be large, it has this peculiarity; the symptoms are some-

times very serious, and apparently out of proportion with the extent of the wound. This is probably because the nervous filaments, are not fairly cut through, but torn apart. What gives colour to this belief is, that the painful effects of such injuries are often suddenly lessened by making the puncture an incision. Supposing this to be a fact, it is only to be explained in one of four ways; either the incision has laid open a purulent collection, or it causes the evacuation of extravasated matter, or completes the section of partially divided nervous filaments, or relieves strangulation, by cutting through fascia or aponeurosis. We know that the symptoms are similar to those resulting from puncture of nervous cords, and we know further that the complete section of the injured nerve often relieves the suffering. In this kind of wound the hæmorrhage is usually not great, except in a few cases where a large vessel is implicated. Almost always the tumefaction is greater than that which occurs in incised wounds. One important peculiarity belongs to them, it is the rapid diminution of the size of the wound; therefore it is unsafe to judge of the depth to which the instrument has penetrated by comparing it with the extent of the wound. For instance, if at half an inch from its point, the instrument is five lines wide, the wound measuring only three, you are not therefore to assume that the instrument has not penetrated to the extent of an inch or more. The consequences of a punctured wound may be very serious : it may penetrate into a cavity, it may wound an artery. But punctured wounds are most grave when a tissue is much intersected, like the palm of the hand and sole of the foot; inflammatory action is then often intense; they may also excite tetanus. I recollect a case of tetanus treated by M. Gaultier de Claubry, succeeding to a sting of a wasp in the sole of the foot, and another is mentioned where the patient trod on a needle. Sometimes the inflammation seems to be excited by strangulation, which may even proceed to gangrene.

Prognosis.—The prognosis of punctured wounds is generally more serious than of incised wounds. In incised wounds we less frequently see those accidents to which we have just referred. In cases of punctured wound of the scalp, erysipelas not unfrequently follows. When we know the accidents which may follow these wounds, we may anticipate them. If the wound be severe, and bleeds but little, we should endeavour to facilitate further bleeding: for instance, if the finger be punctured, by pressure and immersion in warm water we may often unload the vessels, and get rid of irritating substances.

Treatment.—The treatment to be employed in punctured wounds does not differ very much from that of incised wounds—cold local applications, careful dieting, and saline aperients. If the wound be a sword or other similar punc-ture, affecting the chest, although we believe it has not penetrated, it is necessary to bleed ; if a similar wound penetrate a limb, again it is necessary to bleed ; the quantity of blood to be regulated by the severity of the injury and the strength of the patient. If it be probable that a splanchnic cavity is penetrated, the bleeding must be large, and repeated upon the least appearance of re-action. As much as possible the patient should be placed in an inclined position, to admit of the drawing off of any fluid which the wound may contain. In these cases inflammation is sometimes developed in the wound, sometimes in the course of the lymphatics : these should be boldly treated by leeches ; and it is a matter of great importance to place the part in such a position that the return of venous blood may be facilitated. In the limbs the part should be placed on a plane higher than the trunk. In cases where we cannot give the part a position which will facilitate the escape of pus, counter-openings are sometimes necessary. 1 must here urge you to be very careful in making counter-openings ; though, apparently, a simple operation, it requires an accurate knowledge of anatomy. In such a case, so able an anatomist as Boyer once opened the profunda. Be very cautious, therefore, when it is necessary to make the opening near an artery. Sometimes it will happen that though fluctuation was very evident, no pus follows the opening ; you must then introduce a tent, place warm water dressing over it, and very likely in a day or two the pus will flow through the opening. If a foreign substance be contained in the wound, it should be extracted, if superficial or easily removed ; if not, if the foreign body be not likely to excite irritation, it may be left until suppuration has loosened it. In some cases, suction is useful in withdrawing blood or other substance ; but, instead of suction, with all its mummeries, we employ, in the present day, cupping glasses. If used, it must be done prudently, lest by removing clots they occasion hæmorrhage. La Motte and John Bell were strong advocates for their employment.

Incised Wounds.—A fair incised wound is made by an instrument capable of cutting through our tissues without contusing them. Such a wound must be very variable ; it may be a simple incision without loss of substance, or the instrument may cut out a portion of our tissues, and of such an extent as to prevent the sides from being brought together ; this happens sometimes when a flap is taken from the forehead to make a new nose. The part may not be completely cut away, but may be attached by a pedicle ; that pedicle may be large enough to maintain vitality in the flap, or it may not ; in the latter case, it may be gangrened. The wound may implicate the skin, cellular tissue, and muscular fascia—it may extend to the muscles. It may be parallel to the muscular fibres ; then there is little gaping

of the wound ; it may be oblique or perpendicular to the course of the fibres, and the sides of the wound may be then much retracted. It may implicate important blood vessels, and there may be considerable hæmorrhage. Sometimes considerable vessels are cut through without hæmorrhage—in certain amputations, in extirpation of the breast, there is occasionally spontaneous cessation of hæmorrhage. This circumstance is owing, I apprehend, to a moral impression, to pain, to a general spasmodic contraction; perhaps, to some extent, to the contraction of the newly incised tissues upon the vessels. In a few hours this state is dissipated, and hæmorrhage will occur; therefore, in such cases, be upon your guard. The instrument may cut through nervous cords, and the parts to which these nerves proceed may loose sensation and motion. The nerve may be incompletely divided, sensation may remain intact, and motion is not destroyed, but acute pains are felt. It may penetrate to the periosteum, may wound it : sometimes this is not a serious complication, but caries or necrosis may be a consequence. It may implicate the bony tissues, cutting more or less completely through the bone. These wounds are, therefore, in many cases, complex; varying infinitely in their character and their gravity. Their gravity may be modified by age; they are dangerous generally at the two extremes of life; in children the hæmorrhage is often great; in old age adhesion is with difficulty set up. Incised wounds, whether simple or complicated, occasion certain pretty constant symptoms—*Pain* of variable severity, increased by exposure, lessened when the sides of the wound are brought together. *Hæmorrhage*, which is almost a necessary consequence of all wounds : this may be trifling or it may be considerable ; if a tolerably large vessel be not divided it often ceases of itself, becoming more and more serous, until the orifices are blocked up by clots. *Separation of the edges of the wound.* This may depend upon the ordinary elasticity and contractility of tissues, but it may be owing to peculiar situation—supposing a wound of the front of the thigh, cutting through the extensor muscles, it is evident that the position which you give the limb will increase or diminish the separation ; if you flex the thigh upon the pelvis, you will lessen it ; if you extend the thigh, you will increase it.

Almost always, soon after the action of the cutting instruments, the lips of the wound become slightly tumefied. This is a consequence of pain, and without it union would not take place—it is therefore salutary ; but it may become so violent as to prevent immediate union, and may determine suppuration. Exempt from complication and left to itself, I have already described the course which nature takes in small wounds ; but when larger the separation increases, and suppuration is almost inevitable, unless art interfere. Even when the most careful treatment is employed this may happen. However extensive the incision, and however nearly a part may be detached from the body, we must not despair of seeing it united ; the point of attachment may be insufficient to support life in the part, but of this you can never be certain, because a part may be completely detached, and yet may unite. We have known a finger hanging by a single tendon, put in contact and united ; the nose has adhered only by an extremely fine point, brought into apposition with the part from which it has been cut away, and united. An ear, a finger, a nose, has been completely detached, and afterwards united. These examples, it is true, refer principally to the fingers and toes. Can we, from this evidence, infer that a part cut from the back may afterwards unite ? It is possible, but I know no direct evidence in support of it, except that of Baronio, in sheep.—*Lond. Med. Gaz.*

Case in which Tracheotomy was performed for the removal of a Foreign Body in the Air Passages. By BENJAMIN TRAVERS, *Esq., Jun. Communicated by* BENJAMIN TRAVERS, *Esq., F. R. S., &c. &c.*—A child, about six years of age, while seated on the ground, eating cherries, was suddenly thrown backwards, and immediately seized with a violent fit of choking, and every symptom of impending suffocation, a condition which is said to have lasted a full hour. This accident was followed by spasmodic pain in the chest, dyspnœa, and other symptoms of acute inflammation; but the cough ceased so entirely for a considerable time, that the surgeon in attendance concluded that the offending body had passed down the œsophagus, and not into the air-tube. The symptoms, however, recurring with great violence, Mr. Travers was called to see the patient, and at his first visit, two or three weeks after the accident, found the breathing stridulous and laboured, the pulse small and hurried, the countenance suffused and anxious; there were frequent paroxysms of croupy cough, with much consequent exhaustion. The author opened the tracheal tube, between the isthmus of the thyroid gland and the top of the sternum, to the immediate relief of the patient's breathing; and the cough did not return again for some days. Before leaving the patient the author passed a silver catheter upwards through the larynx, with a view of ascertaining that the tube was not obstructed in that direction. Six or seven weeks after the operation the wound was allowed to heal, when the cough shortly re-appeared, with night-sweats and loss of appetite. About a month after the closure of the wound the cherry-stone, which had passed into the tube, was ejected during a violent fit of coughing, accompanied by a small quantity of pus.—*Med. and Chirurg. Soc.*